PROJECT facts

U.S. DEPARTMENT OF ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Natural Gas Processing

05/2001

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EMERGING TECHNOLOGIES FOR THE NATURAL GAS INDUSTRY – PROCESSING AND UTILIZATION

This technology area focuses on development of economically-viable advanced gas conversion and upgrading technologies to fully utilize the domestic supplies of natural gas.

Research in Gas-to-Liquids focuses on chemical means to convert remote natural gas to stable, environmentally attractive liquid fuels, fully compatible with our existing transportation fuel infrastructure, and easy to ship to market. We are also interested in advancing technology for small-scale physical conversion of gas to LNG to enable economic transport of small gas volumes from remote wells without expensive pipeline investment. Specific current focus is on:

- Reducing costs of making the syngas intermediate needed for Fischer-Tropsch chemical synthesis to zero-sulfur, zero-aromatic diesel and naptha liquids, using ceramic membrane, plasma and other technology
- Effecting steady-state, catalytic methane oxidation to higher hydrocarbons using hydrogen-removal membranes
- Harnessing heat-generated sound waves to power LNG refrigeration without needs for electricity or compressors

Research in low-quality gas upgrading focuses on finding lower-cost ways to remove sulfur, carbon dioxide, nitrogen, and other impurities from low-quality gas. The gas purification technologies enable the upgraded gas to meet specifications for pipeline shipment to the marketplace. Specific technology focus is on:

- Microbially enhanced redox solution reoxidation for sweetening sour natural gas
- Methane separation from nitrogen by methane-permeable membranes
- High-efficiency gas-to-liquid packing and contactors for acid gas processing
- Upgrading methane emissions from coal mining and landfill operations to pipeline quality

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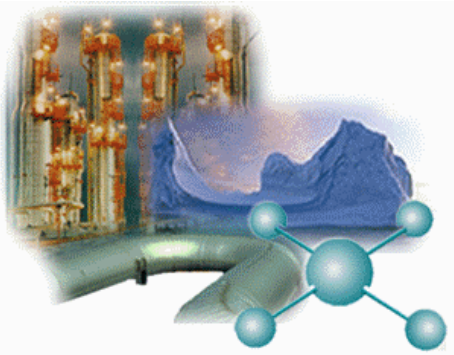
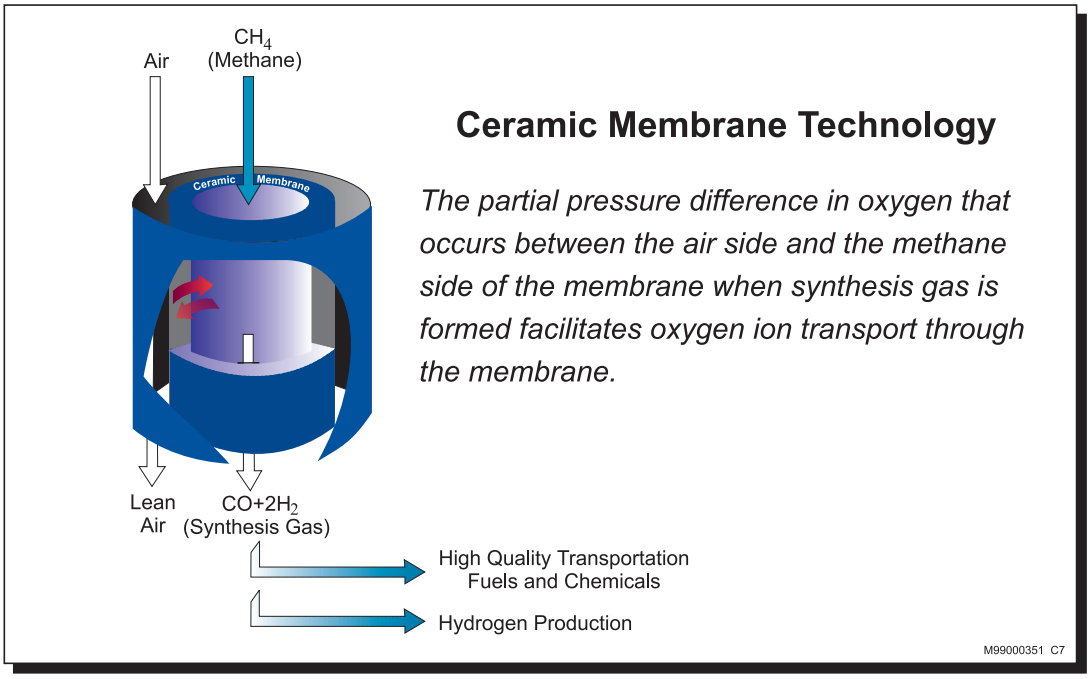
Emerging Technologies for the Natural Gas Industry – Processing and Utilization

Current Activities



- Develop and evaluate syngas generation catalysts and Fischer-Tropsch diesel catalysts and fuels
- Oxygen Transport Ceramic Membrane Reactor System for the Conversion of Natural Gas to Synthesis Gas followed by Conversion to Liquid Transportation Fuels
- Evaluate the transport of GTL products through Trans Alaskan Pipeline Systems (TAPS)
- Hydrogen Transport Membrane Development for the Conversion of Methane to Liquid Hydrocarbons
- Synthesis Gas to Liquid Transportation and Hydrogen Fuels
- Thermoacoustic Natural Gas Liquefier Prototype Scaleup
- Field demonstrations for the removal of natural gas liquids and acid gas
- Liquid absorbent process for the removal of Nitrogen
- Development of composite polyimide hollow fiber membranes for CO2 removal
- Non-aqueous liquid redox process for H2S removal
- Microbial method for H2S removal
- Capture and utilization of coal mine methane for power generation and LNG.



Ceramic Membrane Technology

The partial pressure difference in oxygen that occurs between the air side and the methane side of the membrane when synthesis gas is formed facilitates oxygen ion transport through the membrane.